

NewStep™

Actuator and Motion Controller



User's Manual



Newport®
Experience | Solutions

EU Declaration of Conformity

We declare that the accompanying product, identified with the **CE** mark, complies with requirements of the Electromagnetic Compatibility Directive, 89/336/EEC and the Low Voltage Directive 73/23/EEC.

Model Number:

NewStep Actuator and Motion Controller Family (NSA12 and NSC100)

Year **CE** mark affixed: 2003

Type of Equipment: Electrical equipment for measurement, control and laboratory use

Standards Applied:

Compliance was demonstrated to the following standards to the extent applicable:

BS EN61326-1: 1997+A1+A2 “Electrical equipment for measurement, control and laboratory use – EMC requirements”

This equipment meets the CISPR 11 Class A Group 1 radiated and conducted emission limits.

BS EN 61000-3-2:2001, Harmonic current emissions, Class A

BS EN 61000-3-3:2002, Voltage fluctuations and flicker

BS EN 61010-1:1993, A1+A2 “Safety requirements for electrical equipment for measurement, control and laboratory use”



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Warranty

Newport Corporation warrants that this product will be free from defects in material and workmanship and will comply with Newport's published specifications at the time of sale for a period of one year from date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport office or representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever first occurs.

Limitation of Warranty

The above warranties do not apply to products which have been repaired or modified without Newport's written approval, or products subjected to unusual physical, thermal or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages resulting from the purchase or use of its products.

First printing 2003

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Newport Corporation

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USA

Part No 40745-01, Rev. A

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Service Information

This section contains information regarding factory service for the source. The user should not attempt any maintenance or service of the system or optional equipment beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to Newport Corporation.

Technical Support Contacts

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Irvine, CA 92606

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Telephone: (800) 222-6440 x31694

Europe

Newport/MICRO-CONTROLE S.A.

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45340 Beaune la Rolande, FRANCE

Telephone: (33) 02 38 40 51 56

Newport Corporation Calling Procedure

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at www.newport.com/returns within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#. E-mail: rma.service@newport.com
When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help our Technical Support Representatives diagnose your problem, Please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

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1 Safety Precautions

1.1 Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on NewStep Actuator and Controller where safety-related issues occur.

1.1.1 European Union CE Mark



Figure 1 CE Symbol

The presence of the CE symbol in or on Newport Corporation equipment means that it has been designed, tested and certified as essentially complying with all applicable European Union (CE) regulations and recommendations.

1.1.2 CSA Mark



Figure 2 CSA mark

The presence of the CSA mark” indicates that it has been designed, tested and certified as complying with all applicable U.S. and Canadian safety standards.

1.1.3 Direct Current (DC)



Figure 3 Direct Current Symbol

This symbol indicates on the rating plate that the NewStep Actuator and Controller are suitable for direct current only.

1.2 Warnings and Cautions ---

The following are definitions of the Warnings, Cautions and Notes that are used throughout this manual to call your attention to important information regarding your safety, the safety and preservation of your equipment or an important tip.



WARNING

Situation has the potential to cause bodily harm or death.



CAUTION

Situation has the potential to cause damage to property or equipment.

NOTE

Additional information the user or operator should consider.

Safety Precautions

1.2.1 General Warnings

Observe these general warnings when operating or servicing this equipment:

- Read all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- Only connect the power cord to a grounded power outlet.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp lint-free cloth.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.

1.2.2 General Cautions

Observe these cautions when operating or servicing this equipment:

- Use only the specified replacement parts.
- Follow precautions for static sensitive devices when handling this equipment.
- This product should only be powered as described in this manual.
- There are no user-serviceable parts inside the NewStep Unit.
- If this equipment is used in a manner not specified within this manual, the protection provided by the equipment may be impaired.
- Do not position this equipment in a location that would make it difficult to disconnect the AC power cord.

1.3 Manual Conventions

The following conventions and standards will be used in this manual.

1.3.1 Acronyms

A word formed from the initial letters of a name, for example: Read Only Memory (ROM). In this manual acronyms will appear on the first occurrence and whenever necessary for clarification, acronyms will be enclosed in parentheses following their definition.

1.3.2 Keys, Buttons and Icons

Computer keyboard keys and onscreen buttons and icons are used in the text to describe many user operations. The key-top symbol as it appears on the keyboard, the button or icon name is represented in **boldface type**. For example: **Ctrl** is used for the Control key.

1.3.3 User Input

Text that is required to be typed in, will be shown in the boldface type courier (new) font as shown below:
DISKCOPY A: B:

1.3.4 The Display

Text generated by the computer that appears on its display is presented in the typeface courier (new) font as shown below:
FORMAT complete

2 Features & Specifications

2.1 Product Overview



CAUTION

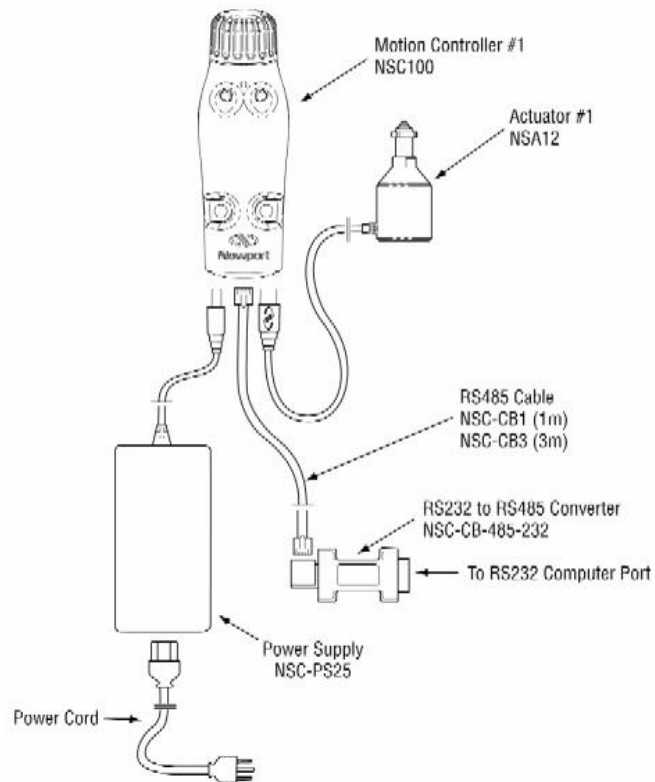
Please note that NextStep Actuator and Controller are high precision instruments. Please use proper care when handling or storing the instrument.

Newport's NewStep™ micrometer replacement actuator and controller is an ideal system for motorizing fine-positioning stages and mounts in opto-mechanical systems. The NewStep™ family has been designed for hands-off adjustment of hard-to-reach mirror mounts. Such applications include hands-off adjustment of hard-to-reach mirror mounts or adjustments of optical mounts that are sensitive to forces applied while twisting a knob. For example, optimizing the alignment of a laser cavity or adjusting the pointing of a beam over a long distance.

2.2 Hardware Configuration

The serial (RS-485) communication interface on the NSC100 controller is accessed through RS485 to RS232 converter. The pin out is designed so that you can plug RS485 to RS232 converter directly into PC's RS232 port.

See diagram next page.



NOTE

NSC100 is designed so that user can manually control NSA12 NewStep actuator by adjusting velocity/enable knob or remotely using PC's RS232 compport to control NSA12 NewStep actuator.

2.2.1 Communication Protocol

The RS-232C interface must be properly configured on both devices communicating. A correct setting is one that matches **all** parameters (baud rate, number of data bits, number of stop bits, parity type and handshake type) for both devices.

The NewStep controller RS-232C configuration is fixed at 19200 bps, **8 data bits, no parity, and 1 stop bit.**

To prevent buffer overflow when data is transferred to the NewStep controller input buffer, a CTS/RTS hardware handshake protocol is implemented. The host terminal can control transmission of characters from the controller by enabling the Request To Send (RTS) signal once the controller's Clear To Send (CTS) signal is ready. Before sending any further characters, the controller will wait for a CTS from the host.

As soon as its command buffer is full, the controller de-asserts CTS. Then, as memory becomes available because the controller reads and executes commands in its buffer, it re-asserts the CTS signal to the host terminal.

2.3 Connection to Non-Newport Controllers

	CAUTION Newport takes no responsibility for improper functioning or damage of an actuator when it is used with any non-Newport controllers.
---	--

	CAUTION Newport guarantees the CE compliance of the NewStep actuators only if they are used with Newport cables and controllers.
---	---

2.4 Features Layout

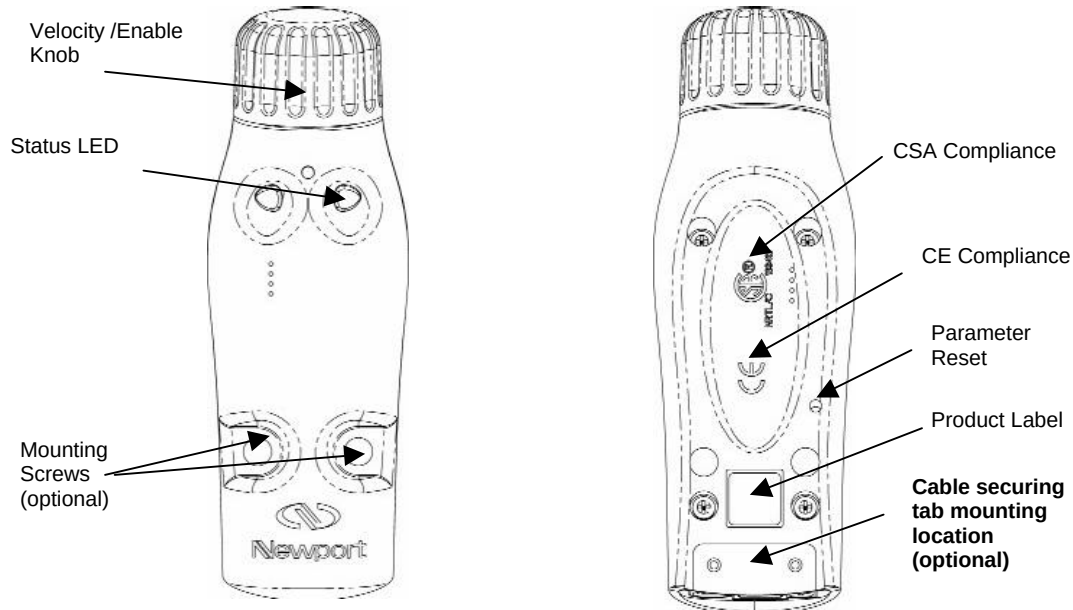


Figure 4 Features Layout View

2.5 Outside Dimensions

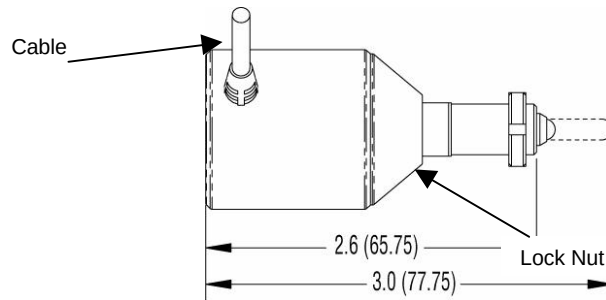


Figure 5 Outline Dimensions for NewStep Actuator.

Safety Precautions

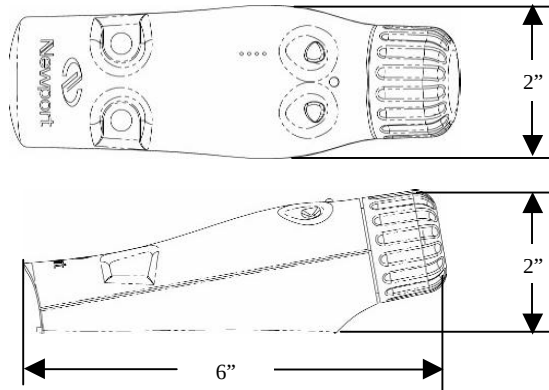


Figure 6 Outline Dimensions for NewStep Controller.

2.5.1 Technical Specifications

NSA12 Actuator Specifications

Size (mm)	Ø30x65
Travel (mm)	11
Motor	Stepper Open loop
Motion sensitivity (μm)	0.3
Repeatability (μm)	0.6
Bi-directional repeatability (μm)	2.5
Max speed (mm/s)	2 (load dependent)
Load capacity (N)	18N minimum
Limit switches	Yes
Remote control	Yes
Computer interface	Yes

Table 1 NSA12 Actuator Specifications

NSC100 Controller Specifications

Output Power Continuous current	0.4A @ 15VDC
Output Voltage Maximum effective output voltage at continuous power	15V @ 0.4A
Input Power Voltage Average Current @ continuous output rating Peak Current @ continuous output rating	15V $\pm$ 5% 0.6A 0.7A

*Table 2 NSC100 Controller Specifications***System Environmental Specifications**

AC Input	100-240VAC, 1.5A 50/60Hz $\pm$ 10%
Operating Temperature	5°C to 40°C
Operating Humidity	<85% relative humidity non-condensing
Storage Temperature	0-60°C RH - <85% non-condensing
Altitude	<2000m (6562 feet)
Installation Category	II
Pollution Degree	2
Use Location	Indoor use only

Table 3 Environmental Specifications

2.5.2 Part Numbers

Part number	Description
NSA12	NewStep Actuator, 12 mm travel
NSC100	NewStep Motion controller
NSC-PS25	Universal power supply
NSC-PSC2	Cable power supply to NSC100, 3 m length
NSC-CB3	RS-485 Cable, 3 m length
NSC-CB-485-232	RS-232 to RS-485 Converter
NSC-JT	RS-485 Junction box

Table 4 Part Numbers

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3 Getting Started

3.1 Unpacking and Handling

It is recommended that the NewStep Actuator and Motion Controller be unpacked in your lab or work site rather than at the receiving dock. Unpack the system carefully, small parts and cables are included with the instrument. Inspect the box carefully for loose parts before disposing of the packaging. You are urged to save the packaging material in case you need to ship your equipment.

3.2 Inspection for Damage

NewStep Actuator and Motion Controller have been carefully packaged at the factory to minimize the possibility of damage during shipping. Inspect the box for external signs of damage or mishandling. Inspect the contents for damage. If there is visible damage to the instrument upon receipt, inform the shipping company and Newport Corporation immediately.



WARNING

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact Newport technical support for advice before attempting to plug in and operate damaged equipment.

3.3 Parts List

The following is a list of parts included with the NewStep Actuator and Motion Controller unit:

1. NewStep Actuator
2. NewStep Controller

3. Power cord/Power supply
4. User's Manual

If you are missing any hardware or have questions about the hardware you have received, please contact Newport.

3.4 Choosing and Preparing Work Surface

The NewStep Actuator and Motion Controller may be placed on any reasonably firm table or bench during operation.

3.5 Electrical Requirements

NewStep Actuator and Motion Controller use low-noise linear AC-DC power supplies to provide internal power. The power supply is auto-sensing for voltages ranging between 100-240VAC, 1.5A at 50/60Hz.

Have a qualified electrician verify the wall socket that will be used is properly polarized and properly grounded.

3.6 Operating Temperature

NewStep Actuator and Motion Controller are designed for operation in a laboratory environment. Recommended ambient operating temperatures are between 20 - 25°C. Operation at higher or lower ambient temperatures for limited periods (e.g. several hours) will not cause any harm but may slightly reduce the performance.

4 Operating NewStep



CAUTION

Before operating the NewStep Actuator and Motion Controller, please adhere to cautions in Section1.

4.1 Overview

4.1.1 Operation Modes

The NewStep Controller has two major Modes of Operation, REMOTE and LOCAL. At power up, the Controller will default into REMOTE Mode. In REMOTE Mode the controller will respond to Computer Communications only and the Speed Adjustment Knob is disabled. In the LOCAL mode, the Speed Adjustment Knob is enabled and the Computer Communications is disabled. The Three colored LED (Yellow, Green, Red) on the body of the NewStep Controller is used to indicate the mode of operation of the Controller. Different colors in conjunction with blinking state represent different operating conditions of the NewStep Controller. The LED Status Table summarizes the possible states for the LED.

A Solid Yellow indicates that the Controller is in REMOTE mode and only Computer Communications is active. A Solid Green is indicative of the Controller being in LOCAL mode, where only the Speed Adjustment Knob is active. A Solid Red is seen whenever a motion related error is detected. The motion related errors are “Motor Not Connected” and “Hard or Soft Travel Limit” detected errors. Also, a blinking Yellow is used when Firmware Download is in progress.

LED	YELLOW	GREEN	RED
Solid	REMOTE Mode	LOCAL Mode	Error Condition
Blinking	REMOTE Mode, In Motion	LOCAL Mode, In Motion	Firmware Download

Table 5 *LED Status Table*

4.1.2 **User Controls**

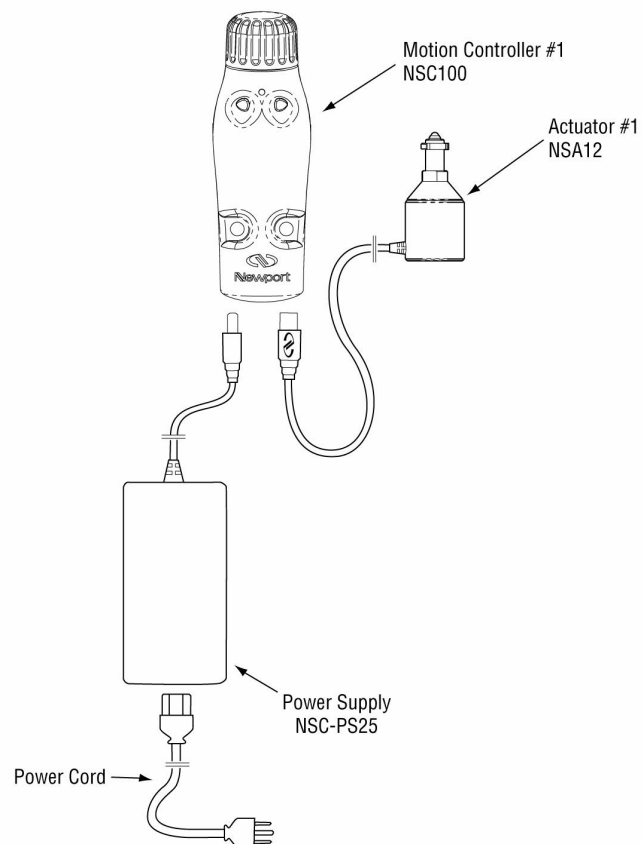
In the LOCAL operations Mode, the controller responds to the Knob Velocity Adjustment commands. Using the Knob the Actuator may be jogged in Forward or Reverse directions. As the Knob position turns in one direction the jog velocity will increase in that direction. There are seven jog speed settings for either direction of the Knob. The Knob is spring loaded and the resting position corresponds to zero speed.

Also, the Knob is equipped with a push button that is used for changing the Operations Mode. By pressing this switch, the mode of operation changes between REMOTE (power up default) and LOCAL mode. This switch is also used for “Homing” the actuator. When this push button is pressed for longer than 5 seconds the Controller will initiate the Homing process, in which the actuator will move toward the Hard limit (Negative direction) and home (Zero Position) before the Negative Hard Limit.

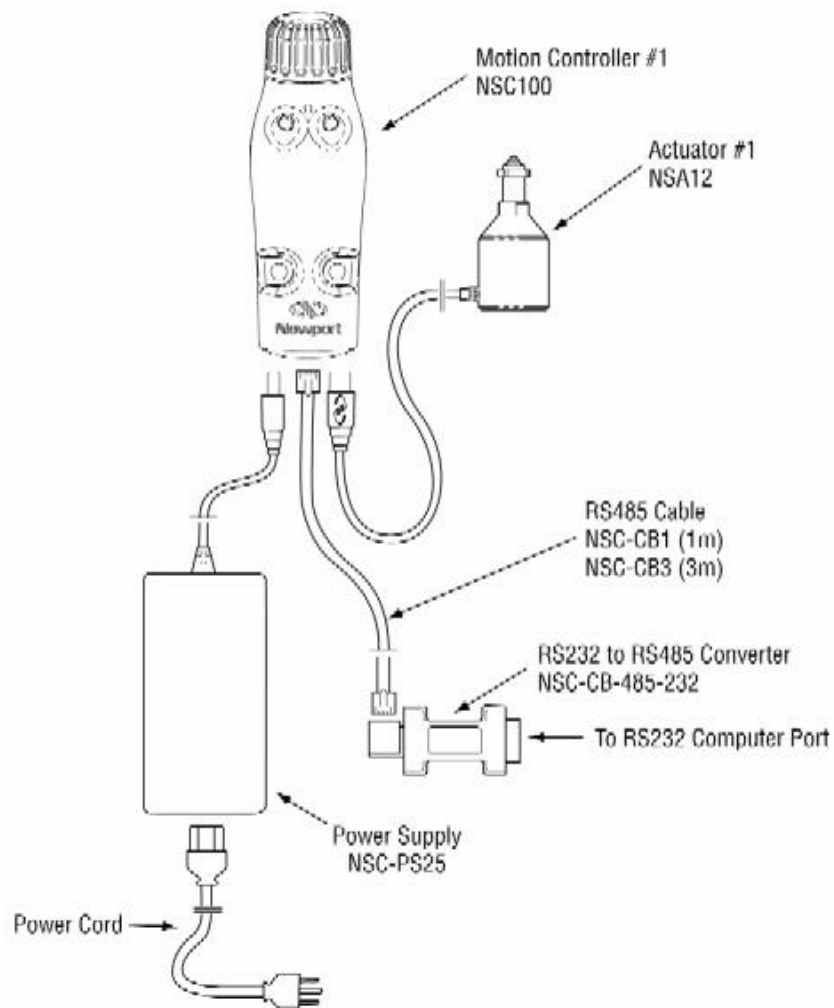
On the back, the Parameter Reset Button is used for restoring factory default Controller Address. The Controller Address is the number that the Computer software will use to communicate with a particular Controller on the RS485 bus. The factory default Controller Address is 0.

Below the Knob there are two side-by-side push buttons that are disabled for this version of the product.

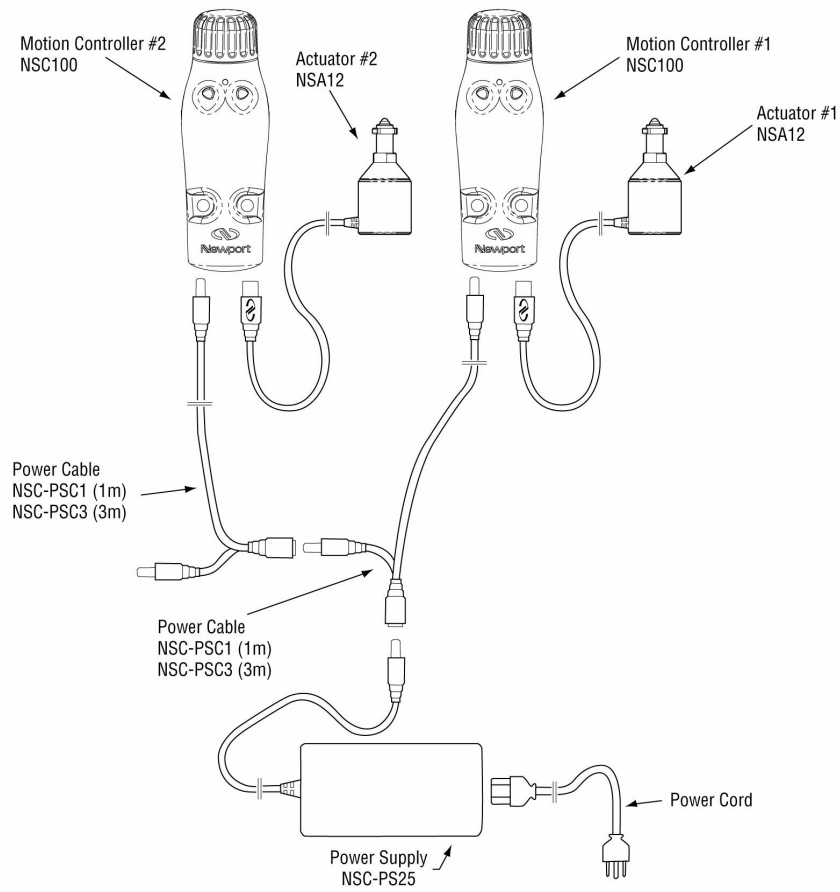
4.1.3 Single Actuator, no Computer Interface (minimal configuration)



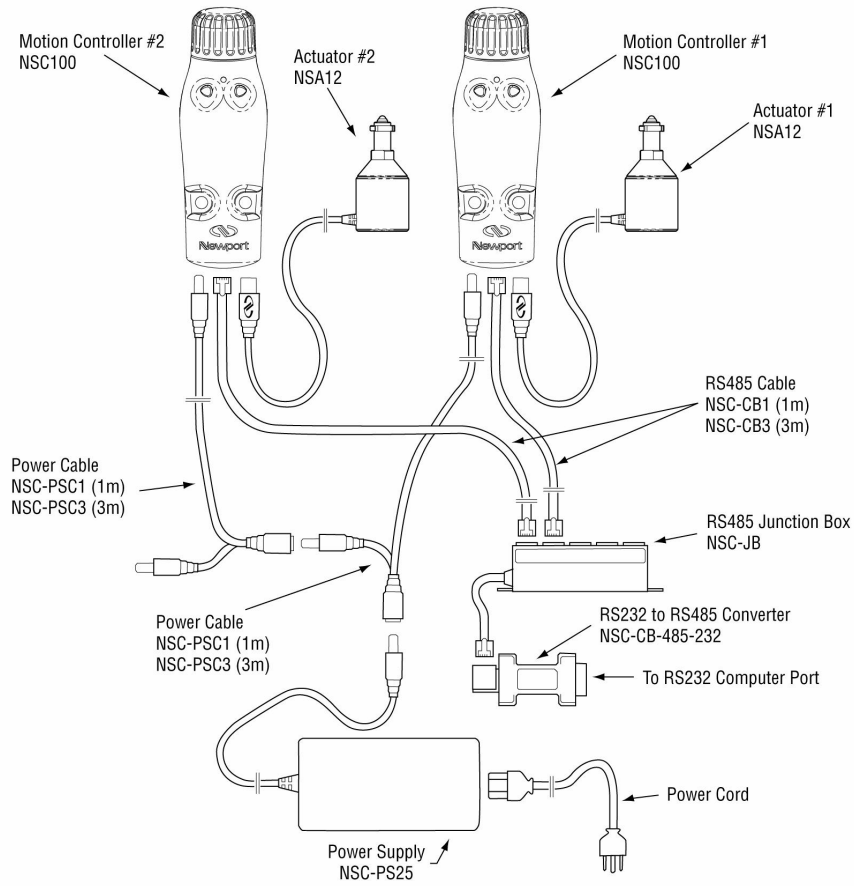
4.1.4 Single Actuator with Computer Interface



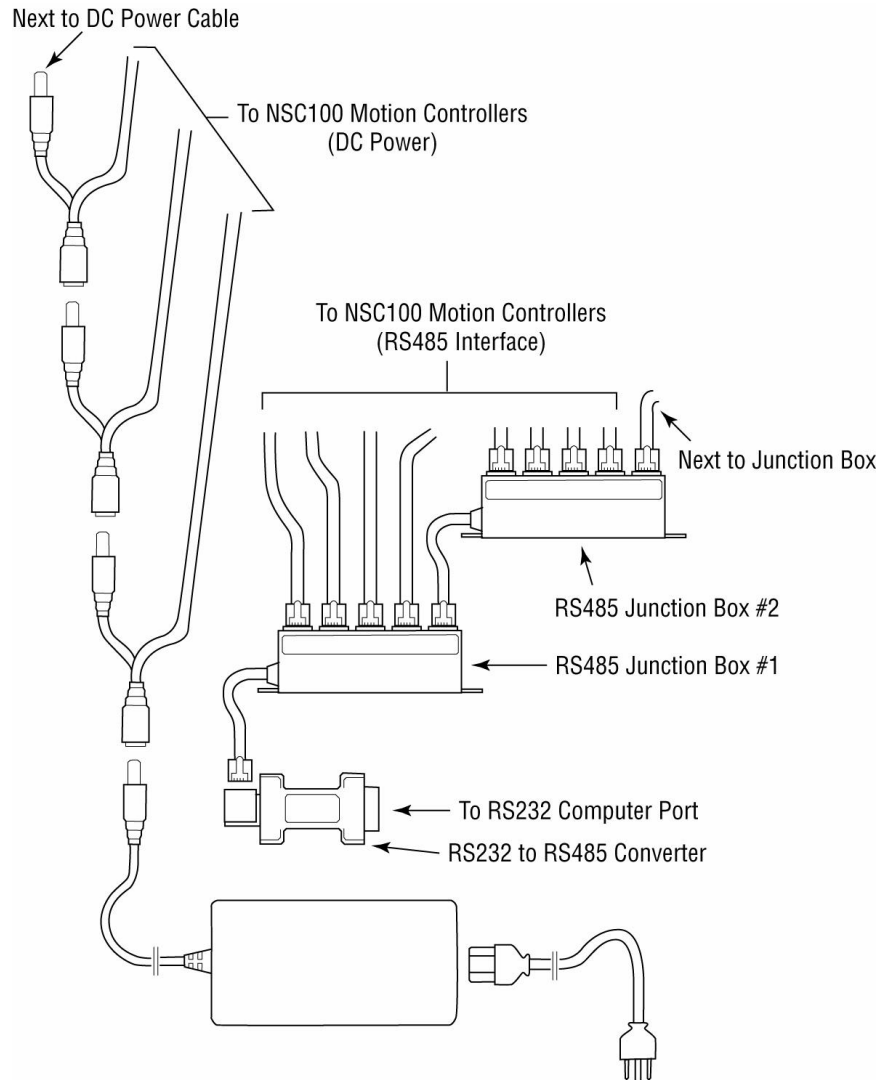
4.1.5 Two Actuators, no Computer Interface



4.1.6 Two Actuators with Computer Interface



4.1.7 Multiple Actuators with Computer Interface



4.2 Operation Modes

The NewStep Controller has two major Modes of Operation, REMOTE and LOCAL. At power up, the Controller will default into REMOTE Mode. In REMOTE Mode the controller will respond to Computer Communications only and the Speed Adjustment Knob is disabled. In the LOCAL mode, the Speed Adjustment Knob is enabled and the Computer Communications is disabled. The Three colored LED (Yellow, Green, Red) on the body of the NewStep Controller is used to indicate the mode of operation of the Controller. Different colors in conjunction with blinking state represent different operating conditions of the NewStep Controller. The LED Status Table summarizes the possible states for the LED.

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Blinking	REMOTE Mode, In Motion	LOCAL Mode, In Motion	Firmware Download

Table 6 LED Status Table

4.3 User Controls

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Operating NewStep

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Below the Knob there are two side-by-side push buttons that are disabled for this version of the product.

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5 Software

5.1 Overview

The Newport NewStep Utility Program provides access to a majority of NewStep Controller's functions and features, such as changing controller configuration, monitoring status, and issuing move/jog commands.

5.2 Software Installation

The Newport NewStep Utility Program (NewStep-Util) is designed to run on any commercially available Pentium™ class desktop personal computer. The computer should have a minimum of 64MB of RAM. Newport recommends using Windows 98™, Windows 2000 or NT.

To begin the installation process, put the CD in your CD driver and double-click on Setup.exe. The installation will give you the option of where to load the files, or you can use the default settings.

5.3 RS-232 Communication Requirements

For instrument communication, the instrument needs to be connected to the RS-232 (COM Port) of the user's PC via an RS232/RS485 converter. The cable required is a DB9 Male/Female Pass-Thru cable.

The pin out is designed to interface directly with an IBM PC or compatible computer, using a straight through cable.

The RS-232C configuration is fixed as follows:

Baud rate=19200bps; Data bits=8; Stop bits=1; Parity=NONE; Flow control=xON / xOFF

5.4 Using NewStep-Util



Figure 7 NewStep-Util Software Icon

NewStep-Util provides control of the features available in the NewStep Controller. After installation is complete reboot your PC and execute NewStep-Util by double-clicking on the newly created icon in Newport / NewStep Controller folder.

“Select Communication Port” window will open.

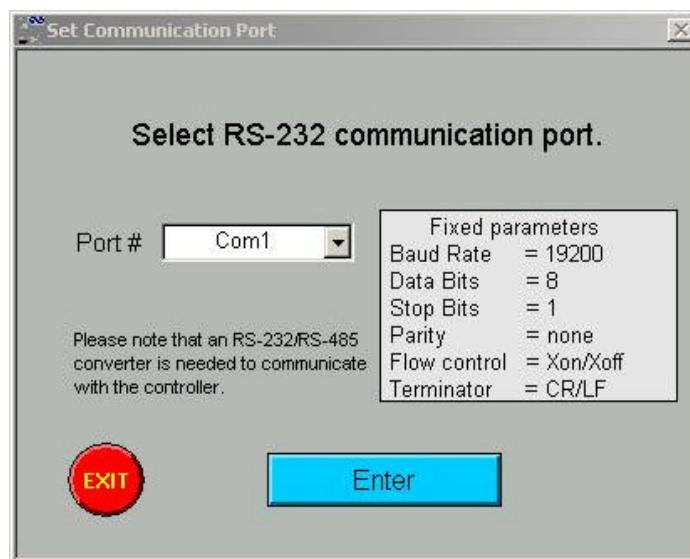


Figure 8 NewStep-Util Opening Screen

Choose Port Type – For RS232 choose the appropriate Port #, for example, Com1 and Press Enter.

Software

After selecting the Port, if the Program finds any Uninitialized Controllers(Controller address equal to zero), the “Initialize Controller” window will open. The user then has to choose a valid controller address (a non-zero value) that has not been assigned to other controllers.

NOTE

When initializing, only one Uninitialized Controller may be connected to the network at a time. After specifying a Controller address and the Controller is initialized, other Uninitialized Controllers may be connected, one at a time, and the “Initialize Controller” Window will open again every time.

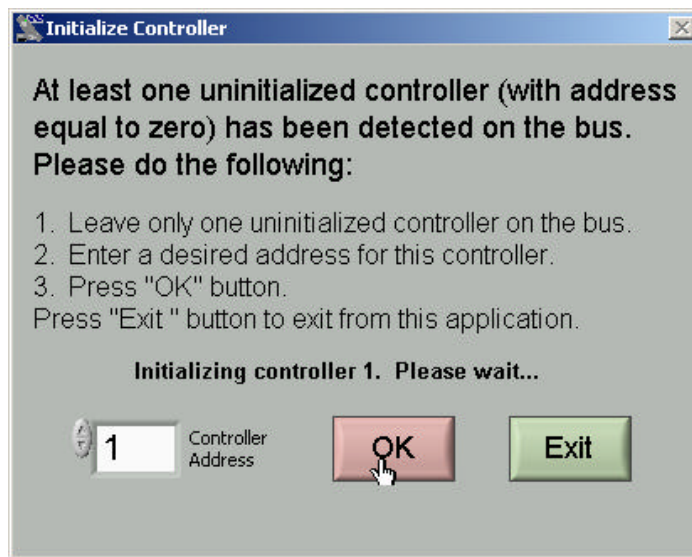


Figure 9 Initializing Controller screen

The program will ask if you want to initialize another Controller.

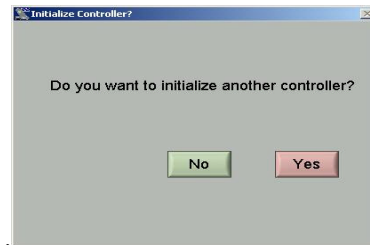


Figure 10 Initializing another Controller dialog box.

After all Controllers are initialized, "Scan Controller" window will open. Select the range of controller numbers to scan for. The maximum range is from 1 to 255.

NOTE

Note that the time taken to scan the bus is proportional to the maximum scan controller addresses selected.

Also, if the check box in the bottom is checked, the program will not scan the RS485 network the next time the program is started

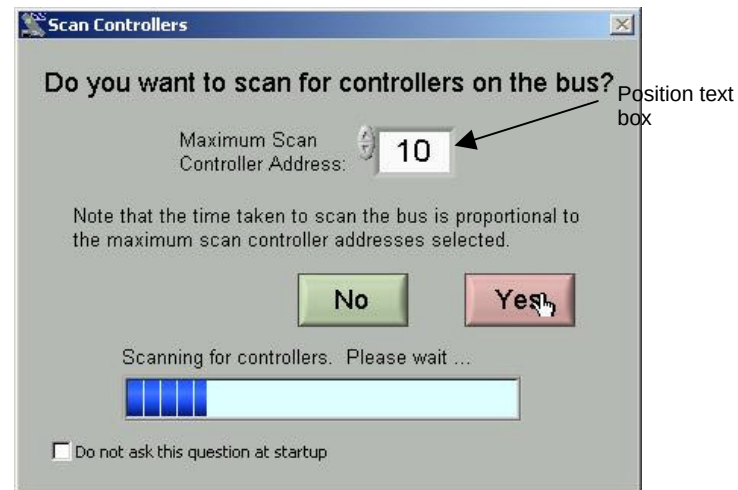


Figure 11 Scan Controllers screen

Software

Now, the main screen will become available.

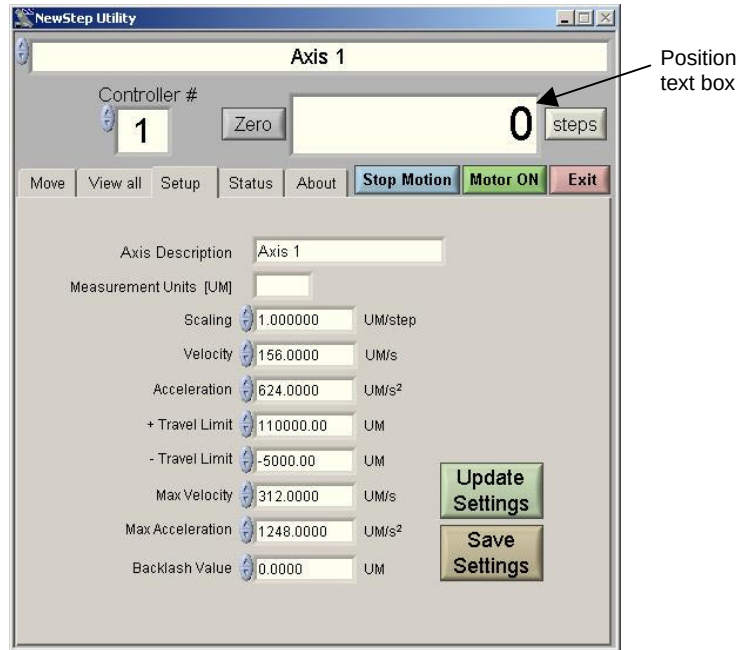


Figure 12 Main screen

The top portion of the main screen shows position information for the selected controller. The position information can be shown in user defined units or micro-steps by clicking on the button next to the position text box. Also, in the top portion, the means to select a Controller (with up/down arrows) is provided. Users can provide custom identification names for their controllers.

NOTE

Note that user can select one Controller at any given time to communicate to; also, the “Stop Motion” and “Motor ON” buttons correspond to the selected Controller.

The main window has five tabs to choose from: **Move, View All, Setup Status, and About.**

The **Setup** tab shows information specific to the selected controller.

1. Axis Description is an arbitrary description that user can define. This is a convenient way for providing custom names to controllers.
2. Measurement units (user units) are a user definable string that will be shown next to the measurements.
3. Scaling is the scaling factor to convert the system units (micro-steps) to user units.

NOTE

The data identified in items 1-3 is not stored in the controller. It is saved by the software in a file on the user's PC.

4. Velocity is the actuator's slew velocity in user units per second.
5. Acceleration is the actuator travel acceleration in user units per second squared.
6. + Travel Limit is the positive software travel limit in user units.
7. - Travel Limit is the negative software travel limit in user units.
8. Max Velocity is the Maximum travel velocity in user units per second.
9. Max Acceleration is the Maximum travel acceleration in user units per second squared.
10. Home preset is the offset used for the Home position. This value is not stored in the controller. Instead, it is used by the software as a virtual home position. By default, this value is equal to zero.
11. Backlash Value is the backlash compensation value in user units the backlash value is applied when change of direction is detected.

Press "Update Settings" button in order for any changes in settings to be sent to the controller.

Press "Save settings" button to save the new settings in the controller EEPROM memory.

The next tab is the **View All** tab. In this screen all the active Controllers on the RS485 network are shown.



1. Jog – Jog is a mouse driven bar that moves the actuator with a specific speed proportional to the mouse location in both positive and negative directions as long as the mouse is clicked.
2. Absolute Move – “Move to”, moves the actuator to the user specified position.
3. Relative Move – “Increment”, moves the actuator by the user specified position increment.
4. Home - clicking on this button will initiate “home search” algorithm.

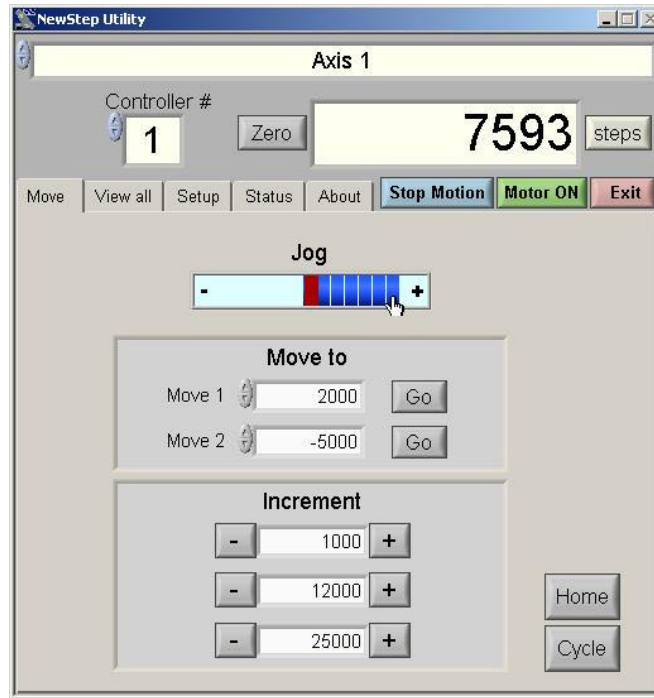


Figure 14 Move Tab Screen

5. Cycle – NewStep Cycle Utility window opens up when the “Cycle” button is clicked. Here the user can specify any two absolute positions between which the actuator has to be moved. The dwell time between moves can be specified in milli-seconds. Clicking on “Start Cycle” button will initiate cycling of the actuator. Clicking on “Stop Cycling” button will stop the actuator cycling. Clicking on “Exit” button will return to the main application.

Software

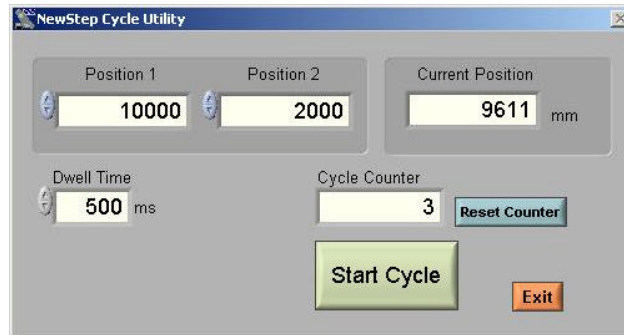


Figure 15 Cycle Utility Screen

The **Status** tab enables the user to review hardware status of LEDs, limit switches, buttons, encoders, etc.



Figure 16 Status screen

The **About** tab will show version of the Software Utility itself, and firmware version for the instrument connected currently.



Figure 17 Software and Hardware Information Screen

6 NewStep Controller ASCII Command Set

6.1 Command Summary

This document describes the supported two-letter ASCII commands that may be used to configure and operate the NewStep Controller, when in REMOTE mode (Yellow LED).

Since multiple NewStep Controllers may be placed on the RS485 Bus, each controller will use a predetermined address (Controller Number) and by decoding the address field of the incoming messages, it can determine if the message is intended for it. If the incoming message does not have a matching address, the controller will ignore the message. When a controller receives a command that matches its address, depending on the message (query or set) it may or may not respond back. If the Controller responds back, it will first send out the command it received followed by the information it is to send.

For example, if a 234VE? Is sent to Controller Number 234, it will respond as 234VE? 1.0.

6.1.1 Summary Table

	Cmd Name	Short Description	Command	Query “?”
1.	AC	Acceleration	Yes	Yes
2.	AU	Maximum Acceleration	Yes	Yes
3.	BA	Backlash Compensation	Yes	Yes
4.	BZ	Restore EEPROM	Yes	No
5.	JA	Jog	Yes	Yes
6.	MF	Motor OFF	Yes	No
7.	MO	Motor ON	Yes	No
8.	OR	Home	Yes	Yes
9.	PA	Absolute Position	Yes	Yes
10.	PH	Hardware Status	No	Yes
11.	PR	Relative Position	Yes	Yes

12.	RS	Reset	Yes	No
13.	SA	Controller Number	Yes	No
14.	SL	Negative Software Limit	Yes	Yes
15.	SM	Save Memory	Yes	No
16.	SR	Positive Software Limit	Yes	Yes
17.	ST	Stop Motion	Yes	No
18.	TE	Tell Error	No	Yes
19.	TP	Tell Position	No	Yes
20.	TS	Controller Status	No	Yes
21.	VA	Velocity	Yes	Yes
22.	VE	Firmware version	No	Yes
23.	VU	Maximum Velocity	Yes	Yes

Table 7 Summary Of Commands Table

Command Set

AC set acceleration

USAGE		IMM	MIP	
		♦		
SYNTAX		xx AC nn or xx AC ?		
PARAMETERS				
Description	xx	[int]	-	Controller number
	nn	[float]	-	Acceleration value
Range	xx		-	0 to 255
	nn		-	0 to the maximum programmed value in AU command or xxAC? to read current setting
Units	xx		-	None
	nn		-	Full Steps/second ²
Defaults	xx	missing:	None	
		out of range:	None	
	nn	missing:	Error 38, Parameter missing	
		out of range:	Error 211, Maximum Acceleration Exceeded	
			Error 230, Command not allowed during motion	
DESCRIPTION		This command is used to set the acceleration value for the actuator. It's execution is immediate. However, if there is motion in progress the command is ignored.		
RETURNS		If the “?” sign takes the place of nn value, this command reports the current setting.		

REL. COMMANDS		AU	-	set maximum acceleration and deceleration
		PA	-	execute an absolute motion
		PR	-	execute a relative motion
		VA	-	set velocity
EXAMPLE		21AC12.5	I	Set acceleration value to 12.5 for controller 21
		21AC?	I	Read the acceleration value from controller 21

Command Set

AU

set maximum acceleration

USAGE	IMM	MIP
	◆	
SYNTAX	xx AU nn or xx AU ?	
PARAMETERS		
Description	xx	[int] - Controller number
	nn	[float] - Acceleration value
Range	xx	- 0 to 255
	nn	- 0 to 500 or xx AU ? to read current setting
Units	xx	- None
	nn	- Full Steps/second ²
Defaults	xx	missing: None
		out of range: None
	nn	missing: Error 38, Parameter missing
		out of range: Error 7, Parameter Out of Range
		Error 230, Command not allowed during motion
DESCRIPTION	This command is used to set the maximum acceleration value for the actuator. It's execution is immediate. However, if there is motion in progress the command is ignored.	
RETURNS	If the “?” sign takes the place of nn value, this command reports the current setting.	
REL. COMMANDS	AC	- set acceleration and deceleration
	PA	- execute an absolute motion
	PR	- execute a relative motion

48	Command Set		
		VA	- set velocity
EXAMPLE		21AU12.5	Set the maximum acceleration to 12.5 for controller 21
		21AU?	Read the maximum acceleration value from controller 21

Command Set

BA set backlash compensation

USAGE	IMM	MIP
	◆	
SYNTAX	xxBA ⁿⁿ or xxBA?	
PARAMETERS		
Description	xx	[int] - Controller number
	nn	[int] - Backlash compensation value
Range	xx	- 0 to 255
	nn	- 0 to 512
Units	xx	- None
	nn	- Micro-steps
Defaults	xx	missing: None
		out of range: None
	nn	missing: error 38, Parameter missing
		out of range: error 7, Parameter out of range
DESCRIPTION	This commands sets the backlash compensation value.	
RETURNS	If the “?” sign takes the place of nn value, this command reports the current backlash setting value.	
REL. COMMANDS	PA	- execute an absolute motion
	PR	- execute a relative motion
EXAMPLE	25BA128	Sets the backlash compensation value to 128 for controller 25
	25BA?	Reads back the backlash compensation value from controller 25

BZ

restore EEPROM content to default

IMM		MIP	
USAGE	◆		
SYNTAX	xxBZ		
PARAMETERS			
Description	xx	[int]	- Controller number
Range	xx		- None
Units	xx		- None
Defaults	xx	missing:	None
		out of range:	None
DESCRIPTION			
This commands restores the default values for all the nonvolatile settings.			
RETURNS			
REL. COMMANDS			
EXAMPLE			
	25BZ		Restores the default settings for controller 25

Command Set

JA

start jog motion

		IMM	MIP
		◆	◆
USAGE			
SYNTAX		xxJA ⁿⁿ or xxJA?	
PARAMETERS			
Description	xx	[int]	- Controller number
	nn	[int]	- Jog setting
Range	xx		- 0 to 255
	nn		- 0 to ±8
Units	xx		- None
	nn		- None
Defaults	xx	missing:	none
		out of range:	none
	nn	missing:	error 38, Parameter missing
		out of range:	error 7, Parameter out of range
DESCRIPTION		This command will start a jog motion with the specified speed setting indicated by nn . nn = 0 Jog velocity = 0 full-steps/sec (0.00 mm/sec, for NSA25) nn = ±1 Jog velocity = ±0.07 full-steps/sec (0.0005 mm/sec, for NSA25) nn = ±2 Jog velocity = ±0.23 full-steps/sec (0.0015 mm/sec, for NSA25) nn = ±3 Jog velocity = ±0.78 full-steps/sec (0.005 mm/sec, for NSA25) nn = ±4 Jog velocity = ±3.12 full-steps/sec (0.02 mm/sec, for NSA25) nn = ±5 Jog velocity = ±15.62 full-steps/sec (0.1 mm/sec, for NSA25) nn = ±6 Jog velocity = ±48.87 full-steps/sec (0.3 mm/sec, for NSA25) nn = ±7 Jog velocity = ±156.62 full-steps/sec (1.0 mm/sec, for NSA25)	
RETURNS		If the “?” sign takes the place of nn value, this command reports the last speed setting value.	
REL. COMMANDS		ST	- Stop Motion
EXAMPLE		25JA-5	Start Jog motion with -50 fs/sec for controller 25
		25JA?	Reads back the value of the last Jog speed from controller 25

MF**motor off**

USAGE	IMM	MIP
	◆	◆
SYNTAX	xxMF	
PARAMETERS		
Description	xx	[int] - Controller number
	nn	[int] - On/off
Range	xx	- 0 to 255
		-
Units	xx	- None
		-
Defaults	xx	missing: None
		out of range: None
DESCRIPTION		
This command will turn the motor off.		
RETURNS		
This command has no return value.		
REL. COMMANDS	ST	- Stop Motion
		-
EXAMPLE	43MF	Turn motor (actuator) off for Controller 43

Command Set

MO

motor on

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxMO	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: None out of range: None
DESCRIPTION	This command will turn the motor ON.	
RETURNS	This command has no return value.	
REL. COMMANDS	ST	- Stop Motion
EXAMPLE	43MO	Turn motor (actuator)ON for Controller 43

OR search for home

USAGE	IMM	MIP
	♦	
SYNTAX	xxOR	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: none
		out of range: none
DESCRIPTION	This command will start the process of homing the actuator to its negative hard limit. Once the actuator is homed, the position is set to zero.	
RETURNS	This command will return 1 if the actuator has been Homed and 0 if it has not been Homed since the last power up.	
REL. COMMANDS	ST	- Stop Motion
EXAMPLE	35OR	Home the actuator on Controller 35
	35OR?	Return 1 or 0 if the actuator has been Homed or not

Command Set

PA

move to absolute position

USAGE	IMM		MIP	
	◆			
SYNTAX	xxPAnn or xxPA?			
PARAMETERS				
Description	xx	[int]	-	Controller number
	Nn	[int]	-	Position value
Range	xx		-	0 to 255
	nn		-	-60000 to 120000
Units	Micro-steps			
Defaults	xx	Missing:		None
		out of range:		None
	nn	missing:		Error 37, Parameter Missing
		out of range:		Error 7, Parameter Out of Range
			Error 213, Motor Off	
			Error 230, Command not allowed during motion	
DESCRIPTION				
This command initiates an absolute motion. When received, a trapezoidal trajectory is generated with the predefined acceleration and velocity and the actuator will move to the absolute position specified by nn. Note: The command is not accepted while a motion is in progress.				
RETURNS	If the “?” sign takes the place of nn value, this command reports the last commanded position. Which is the same as the value read back from TP? ± the predefined Backlash value, if there was a change of direction.			

REL. COMMANDS		AC	-	set acceleration
		PR	-	move to relative position
		ST	-	stop motion
		VA	-	set velocity
EXAMPLE		12PA250		<i>Move Actuator on controller 12 to absolute position 250</i>
		12PA?		<i>Read back the last commanded position</i>
			-	

Command Set

PH

get hardware status

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxPH?	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: None
		out of range: None
DESCRIPTION	This command will return the value of the I/O ports of the processor in the Controller. The are 3 bytes reported for 3 ports B, D, and E represented in a decimal format. NOTE: The retuned value are 3 bytes represented in decimal format. Once converted to a binary representation the below Bit Map table can be used determine the state of each I/O line.	
RETURNS	3 bytes for the values of the I/O ports.	
REL. COMMANDS	none	-
EXAMPLE	14PH?	Returns the value of the I/O ports (3 bytes) of controller 14

Bit Map Table

Bit 23	=	Debugger pin PGData
Bit 22	=	Debugger pin PGClcock
Bit 21	=	Debugger pin PGM
Bit 20	=	Driver Fault line 2
Bit 19	O	Driver Enable 2
Bit 18	=	Driver Fault line 1
Bit 17	=	Encoder B
Bit 16	=	Encoder A
Bit 15	=	Low Voltage Detect
Bit 14	=	Jog Knob Switch
Bit 13	=	Button B
Bit 12	=	Button A
Bit 11	=	Device Reset Button
Bit 10	=	Spare
Bit 9	=	Positive Travel Limit
Bit 8	=	Negative Travel Limit
Bit 7	=	N/A
Bit 6	=	N/A
Bit 5	=	N/A
Bit 4	=	N/A
Bit 3	=	N/A
Bit 2	O	EEPROM Write Protect
Bit 1	O	Red LED
Bit 0	O	Green LED

Command Set

PR

move by relative position

USAGE	IMM	MIP
	◆	
SYNTAX	xxPRnn or xxPR?	
PARAMETERS		
Description	xx	[int] - Controller number
	Nn	[int] - Position value
Range	xx	- 0 to 255
	nn	- -60000 to 120000
Units	Micro-steps	
Defaults	xx	Missing: None
		out of range: None
	nn	missing: Error 37, Parameter Missing
		out of range: Error 7, Parameter Out of Range
		Error 213, Motor Off
		Error 230, Command not allowed during motion
DESCRIPTION	This command initiates a relative motion. When received, a trapezoidal trajectory is generated with the predefined acceleration and velocity and the actuator will move to the relative position specified by nn .	
	NOTE: The command is not accepted while a motion is in progress.	
RETURNS	If the “?” sign takes the place of nn value, this command reports the last commanded position. Which is the same as the value read back from TP? ± the predefined Backlash value, if there was a change of direction.	

REL. COMMANDS		AC	-	set acceleration
		PR	-	move to relative position
		ST	-	stop motion
		VA	-	set velocity
EXAMPLE		12PR250		<i>Move Actuator on controller12by+250 micro-steps</i>
		12PR?		<i>Read back the last commanded position</i>
			-	

Command Set

RS

reset the controller

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxRS	
PARAMETERS		
Description	xx	[int] - Controller Number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: none out of range: none
DESCRIPTION	This command will reset the controller. This command will soft reset the processor in the controller.	
RETURNS	This command has no return value.	
REL. COMMANDS	none	-
EXAMPLE	31RS	<i>Reset Controller31</i>

SA **set controller address**

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxSAnn	
PARAMETERS		
Description	xx	[int] - Controller number, current
	nn	[int] - Controller number, new
Range	xx	- 0 to 255
	nn	- 0 to 255
Units	xx	- None
	nn	- None
Defaults	xx	missing: none
		out of range: none
	nn	missing: error 38, Parameter missing
		out of range: error 7, Parameter out of range
DESCRIPTION	This command sets the Controller number.	
RETURNS	This command has no return value.	
REL. COMMANDS	none	-
EXAMPLE	0SA14	Sets the Controller number from 0 to 14

Command Set

SL

set left travel limit

		IMM	MIP
USAGE	—	◆	
SYNTAX	—	xxSLnn or xxSL?	
PARAMETERS	—		
Description	—	xx	[int] - Controller Number
	—	nn	[int] - Negative Software limit
Range	—	xx	- 0 to 255
	—	nn	- -60000 to 1200000
Units	—	xx	- None
	—	nn	- Micro-steps
Defaults	—	xx	Missing: None
	—		out of range: None
	—	nn	missing: Error 37, Parameter Missing
	—		out of range: Error 7, Parameter Out of Range
	—		Error 230, Command not allowed during motion
DESCRIPTION	—	This command will set the value of the negative software limits. NOTE: The value of Negative software limit should be less than the value of the Positive Software limit.	
RETURNS	—	If the “?” sign takes the place of nn value, this command reports the value of the Negative Software limit.	
REL. COMMANDS	—	SR	- Positive Software Limit
	—	PA	- Absolute Move
	—	PR	- Relative Move
	—	JA	- Jog
EXAMPLE	—	72SL-100	Sets the value of Negative software limit to -100 for controller 72
	—	725SL?	Reads back the value of the Negative Software Limit from controller 72

SM**save settings to non-volatile memory**

USAGE	IMM	MIP
	◆	
SYNTAX	xxSM	
PARAMETERS		
Description	xx	[int] - Controller Number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: none
		out of range: none
DESCRIPTION		
	This command is used to save controller configuration settings from RAM to non-volatile EEROM memory. It should be used after modifying parameters and settings to assure that the new data will not be lost when the controller is powered off.	
RETURNS	This command has no return value.	
REL. COMMANDS	none	
EXAMPLE	61SM	save changes for controller 61 to non-volatile memory

Command Set

SR

set right travel limit

USAGE	IMM	MIP
	♦	
SYNTAX	xxSRnn or xxSR?	
PARAMETERS		
Description	xx	[int] - Controller number
	nn	[int] - Positive software limit
Range	xx	- 0 to 255
	nn	- -60000 to 1200000
Units	xx	- None
	nn	- Micro-steps
Defaults	xx	Missing: None
		out of range: None
	nn	missing: Error 37, Parameter Missing
		out of range: Error 7, Parameter Out of Range
		Error 230, Command not allowed during motion
DESCRIPTION	This command will set the value of the negative software limits. NOTE: The value of positive software limit should be larger than the value of the Negative Software limit.	
RETURNS	If the “?” sign takes the place of nn value, this command reports the value of the Positive Software limit.	
REL. COMMANDS	SL	- Negative Software Limit
	PA	- Absolute Move

		PR	-	Relative Move
		JA	-	Jog
EXAMPLE		72SR-100		<i>Sets the value of Positive software limit to -100 for controller 72</i>
		725SR?		<i>Reads back the value of the Positive Software Limit from controller 72</i>

Command Set

ST

stop motion

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxST	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: none out of range: none
DESCRIPTION	This command stops a motion in progress using deceleration rate programmed with AC (set deceleration) command on the specified controller.	
RETURNS	This command has no return value.	
REL. COMMANDS	MO	- Motor ON/OFF
EXAMPLE	41ST	Stops the motion of the actuator on controller 41

TE read error code

USAGE	IMM	MIP
	◆	◆
SYNTAX	xxTE?	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: None
		out of range: None
DESCRIPTION	This command is used to read the error code.	
RETURNS	Error Code as described in table below	
REL. COMMANDS	none	-
EXAMPLE	23TE?	Returns Error code

Command Set

Error Code Table

Description	Error Code
No Errors	0
Driver Fault (Open Load)	1
Driver Fault (thermal shut down)	2
Driver Fault (Short)	3
Invalid Command	6
Parameter Out of Range	7
No Motor connected	8
Brown Out	10
Command Parameter Missing	38
Positive Hardware Limit Detected	24
Negative Hardware Limit Detected	25
Positive Software Limit Detected	26
Negative Software Limit Detected	27
Max Velocity Exceeded	210
Max Acceleration Exceeded	211
Motor Not Enabled	213
Switch to invalid axis	214
Homing Aborted	220
Parameter Change Not Allowed During Motion	226

TP**read position**

USAGE		IMM ◆	MIP ◆
SYNTAX		xxTP?	
PARAMETERS			
Description	xx	[int]	- Controller number
Range	xx		- 0 to 255
Units	xx		- None
Defaults	xx	missing:	None
		out of range:	None
DESCRIPTION	This command returns the position of the actuator in micro-steps. NOTE: The controller operates in an “open loop” fashion and it returns the “theoretical” value of the position. Therefore, the actual actuator position may be different from the read-back value.		
RETURNS	Position in micro-steps		
REL. COMMANDS	PA	-	Absolute Position
	PR	-	Relative Position
	JA	-	Jog
EXAMPLE	25TP?		Returns the position value of the Actuator on controller 25.

Command Set

TS

controller status

USAGE	IMM	MIP
	◆	◆
SYNTAX	xxTS?	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: None out of range: None
DESCRIPTION	This command returns the controller status as following Motor ON & Motion NOT In progress 81 Q Motor ON & Motion In progress 80 P Motor OFF & Motion NOT In progress 64 @	
RETURNS	Position in micro-steps	
REL. COMMANDS	MO Motor ON MF Motor OFF TP Tell Position TE Tell Error	
EXAMPLE	25TS? Returns the controller status for controller 25.	

VA**set velocity**

USAGE	IMM		MIP	
	◆			
SYNTAX	xxVA _{nn} or xxVA?			
PARAMETERS				
Description	xx	[int]	-	Controller number
	nn	[float]	-	Velocity
Range	xx		-	0 to 255
	nn		-	0 to the maximum programmed value in VU command or xxVA? to read current setting
Units	xx		-	None
	nn		-	Full-steps/second
Defaults	xx	missing:		none
		out of range:		none
	nn	missing:		Error 37, Parameter Missing
		out of range:		Error 210, Max Velocity exceeded Error 230, Command not allowed during motion
DESCRIPTION	This command set the value of Velocity in full-step/second.			
RETURNS	The value of Velocity in full-steps/second			
REL. COMMANDS	VU	-		Maximum Velocity
	AC	-		Acceleration
	AU	-		Maximum Acceleration
EXAMPLE	17VA26.6		Sets the Velocity for controller 17 to 26.6 full-steps/second	
	17VA?		Reads back the value of Velocity	

Command Set

VE

read controller firmware version

USAGE	IMM	MIP
	♦	♦
SYNTAX	xxVE?	
PARAMETERS		
Description	xx	[int] - Controller number
Range	xx	- 0 to 255
Units	xx	- None
Defaults	xx	missing: none out of range: none
DESCRIPTION	This command returns the firmware version with a "Major.Minor" format.	
RETURNS	Firmware version	
REL. COMMANDS	none	
EXAMPLE	38VE?	↓ Returns Firmware version of the controller 38.

VU**set maximum velocity**

USAGE		IMM	MIP
		◆	
SYNTAX		xxVUnn or xxVU?	
PARAMETERS			
Description		xx	[int] - Controller number
		nn	[float] - Velocity
Range		xx	- 0 to 255
		nn	- 0 to the maximum programmed value in VU command or xxVA? to read current setting
Units		xx	- None
		nn	- Full-steps/second
Defaults		xx	missing: none
			out of range: none
		nn	missing: Error 37, Parameter Missing
			out of range: Error 7, Parameter Out of Range
			Error 230, Command not allowed during motion
DESCRIPTION		This command set the value of MaximumVelocity in full-step/second.	
RETURNS		The value of Maximum Velocity in full-steps/second	
REL. COMMANDS		VA	- Maximum Velocity
		AC	- Acceleration
		AU	- Maximum Acceleration
EXAMPLE		17VU200	Sets the Velocity for controller 17 to 200 full-steps/second
		17VA?	Reads back the value of Velocity

7 Maintenance & Service



CAUTION

There are no user serviceable parts inside the NewStep Actuator and Motion Controller. Work performed by persons not authorized by Newport Corporation will void the warranty.

7.1 Enclosure Cleaning

The NewStep Actuator and Motion Controller should only be cleaned with a soapy water solution. Do not use an acetone or alcohol solution, this will damage the finish of the enclosure.

7.2 Technical Support

This section contains information regarding factory service for the NewStep Actuators and Controllers. The user should not attempt any maintenance or service of the equipment. Any problem that cannot be resolved should be referred to Newport Corporation.

Telephone	1-800-222-6440
Fax	1-949-253-1479
Address	Newport Corporation Service Department. 1791 Deere Ave. Irvine, CA 92606
Email	tech@newport.com istd.service@newport.com
Web Page URL	http://www.newport.com/Support/Technical_Help/ http://www.newport.com/Support/Service_and_Returns/

Table 8 Technical Customer Support Contacts

Contact Newport to obtain information about factory service. Telephone contacts number(s) are provided on a Service Form. Please have the following information available:

- Equipment model number (NSC100 NewStep Motion Controller or NSA12 Actuator)
- Equipment Serial Number
- Problem Description (document this by using the Service Form)

If the instrument is to be returned for repair, the user will be given a Return Authorization Number that should be referenced in their shipping documentation. Complete a copy of the Service Form as represented in sub-section 9.5 and include it with your shipment

7.3 Service Form



Newport®
Experience | Solutions

Newport Corporation
U.S.A. Office: 800-222-6440
FAX: 949/253-1479

Name _____ **Return Authorization** _____
(Please obtain RA# prior to return of item)

Company _____
(Please obtain RA # prior to return of item)

Address _____ Date _____

Country _____ Phone Number _____

P.O. Number _____ FAX Number _____

Item(s) Being Returned:

Model # _____ Serial # _____

Description _____

Reason for return of goods (please list any specific problems):
